1.0 TITLE OF EFFORT: CEV GFE Projects and CFE Quality Support (WBS 1.5.7)

2.0 TASK DESCRIPTION:
Coordinate and conduct S&MA activities for authorized CEV Project quality and flight equipment projects (which may include GFE, CFE, and payloads), provide and discuss S&MA topics and issues, and participate in all S&MA activities associated with the GFE life-cycle as defined in €A-WI-023 and EA-WI-025. Provide support to on-orbit operations including integrated operations assessments. Review proposals and change requests for system designs and design modifications in order to assess S&MA impacts and identdy S&MA issues for GFE assets.

2.1 STATEMENT OF WORK REFERENCE: Section **5.0** - Program Support, Section 6.0 - JSC Project Support, Section 8.0 - Advanced Programs, Assurance Methodologies, and Special Processes

2.2 Crew Exploration Vehicle (CEV) Project Support (WBS 1.5.7.1)

2.2.1 CEV Project GFE Safety and Reliability (WBS 1.5.7.1.x)
Perform flight safety, reliability, and mission assurance for **GFE.** Provide safety and Mission Assurance for GFE payloads. Participate in development and modification of hardware and software to identify and iscuss hardware criticality assessments and define S&MA requirements. Ldentify design problems and provide design solutions or improvements.
   a. Participate in design reviews, participate in project Integrated Product Teams **(IPTs),** participate in CEV panels and working groups (as required), review provided data and documentation, and provide RID'S on S&MA-related issues and deficiencies.
   b. Identify potential hazards, evaluate proposed hazard controls, and evaluate methods for verification of hazard controls.
   c. Identify potential critical items list failure modes, causes, effects, methods of verification, and acceptance rationale.
   d. Track and provide status on requirements verification, system qualification, and design certification activities.
   e. Identify missing or non-compliant **S&MA** requirements as well as performance requirements that cannot be verified.
   f. Conduct S&MA assessments, prepare presentations, and present results of those assessments to S&MA management, project management, and the CEV Project for discussion.
   g. Assure that hardware operational uses, operating limits, hazard controls, and fault tolerance are verified prior to flight.
   h. Participate in problern/anomaly investigations during all phases of a project to assure that the problems are appropriately documented; adequate and appropriate investigation is planned and conducted; closure rationale is acceptable and complete; and visibility of the problemlanomaly is elevated to the appropriate S&MA management level.
   i. Support operational use of hardware and software.

2.2.2. CEV Project GFE Quality Assurance (WBS 1.5.7.1.x)
Provide Quality Assurance support for GFE.
   a. Perform non-RITF related hardware inspection, verification, and documentation tasks associated with receiving, inspecting, fabricating, assembling, testing, processing, and shipping of GFE at JSC facilities.
   b. Perform designated Government Mandatory Inspection Points (GMI P's).
   c. Oversee facility maintenance on human-rated chambers and testing labs, and support fit-checks, installation, test readiness, test, and checkout of hardware at JSC and other NASA and contractor facilities.

d. Conduct surveillance of flight systems handling and processing as well as ground facilities with regard to receiving, inspecting, fabricating, assembling, testing, processing, and shipping of GFE at JSC facilities.
e. Participate as team members or team leaders of process and requirements implementation audits conducted at JSC and contractor facilities.
f. Prepare and submit QREX Reports.

2.2.3 CEV Project GFE Quality Engineering (WBS 1.5.7.1.x)Provide Quality Engineering support for GFE.
a. Assess design as well as implementation and verification of S&MA requirements.
b. Assess plans and procedures for manufacturing and test of hardware.
c. Perform documentation reviews and evaluation tasks associated with receiving, inspection, fabrication, assembly, test, processing, and shipment of GFE at JSC facilities.
d. Conduct siirveillance of flight hardware with regard to receiving, inspecting, fabricating, assembling, testing, processing and shipping of GFE at JSC facilities.
e. Perform readiness assessments prior to shipment of flight hardware.
f. Support special teams conducting assessments and investigations.

2.2.4 CEV Project GFE Software Assurance (WBS 1.5.7.1.x)
Provide Software Assurance, including software safety, software reliability, software quality engineering, software quality assurance, and software verification and validation, for GFE flight and ground systems.
a. Ensure the conformance of software lifecycle processes and products to **CxP** requirements, standards, and procedures.
b. Define Software Assurance requirements.
c. Perform process and product assessment throughout the life cycle to provide objective insight into the maturity and quality of the software processes and products.
d. Ensure that the software safety requirements are clearly identified, documented, traced and controlled throughout the software lifecycle
e. Perform analysis of the consistency, completeness, correctness and testability of software safety requirements.
f. Ensure the testing of software safety critical components are sufficiently implemented and that applicable controls are in place to verify all safety conditions Conduct analysis of proposed changes on software safety Evaluate the reliability of the software products created throughout the life cycle
g. Ensure that the software being developed or maintained satisfies the functional and performance requirements
h. Ensure that each phase of the development process yields the right software products
i. Participate in major milestone reviews and certification/acceptance of the software.
j. Conduct surveillance of GFE software lifecycle activities.

2.2.5 CEV CFE Quality Engineering (QE) (WBS 1.5.7.1.x)
Perform Quality Engineering (QE) functions at the Project-level:
a. Participate in design reviews, review provided data and documentation, and provide RIDS on S&MA-related issues and deficiencies.
b. Review proposed implementation of quality requirements.
c. Ensure effective performance of Government Contract Quality Assurance for work performed by NASA prime contractors
d. Identify the processes needed for the quality management system and their application throughout the CEV Project. Determine the sequence and interaction of these processes. Determine criteria and methods needed to ensure that both the operation and control of these processes are effective. Ensure the availability of resources and information necessary to support the operation and monitoring of these processes. Monitor, measure and analyze these processes.
e. Implement actions necessary to achieve planned results and continual improvement of these processes

f. Review plans for production.
g. Ensure readiness to proceed with design, development, or manufacturing, as well as Certification of Flight Readiness (CoFR) Reviews Assure inclusion of necessary quality requirements flowdown to suppliers.
h. Review and approve waivers and deviations against CEV Quality Assurznce requirements
i. Ensure that verifications of Government Mandatory Inspection Points (GMIPs) are properly identified and executed during vehicle processing Ensure the implementation of Foreign Object Debris (FOD)/Contamination Control Plans by the CEV Project and its prime contractors, and verify compliance.

2.2.6 CEV Project GFE and CFE Audits (WBS 1.5.7.1.x)
Participate in NASA-sponsored audits.
a. Perform process assessments and audits, and prepare reports documenting results.
b. Perform statistical analyses, and benchmark S&MA processes.
c. Perform technical and metric analyses, and present results.
d. Participate in joint audits with other NASA Centers or government entities to verify S&MA requirements and implementations at NASA contractors, subcontractors, and vendors.
e. Perform independent surveillance and periodic audits of contractor and subcontractor on S&MA products and processes.

2.2.7 Pyrotechnics Support (WBS 1.5.7.1.x)
Provide Pyrotechnics expertise to conduct all safety and reliability requirement assessments, reviews, evaluations, reporting, and recommendations related to all aspects of the Pyrotechnics Subsystems associated with the Crew Exploration Vehicle (CEV), the Lunar Lander and the associated launch vehicle. This will cover storage, transportation, installation, testing, activation/deployment, and safing of the Subsystems, hardware and software/firmware components. This also covers all pyrotechnic applications, support requirements and operations for all mission phases to include: storage, transportation, installation, pad escape, launch, assent staging, mission aborts, mission uses, re-entry and recovery.

2.3 CEV Parachute Assembly System (CPAS) (WBS 1.5.7.2)

2.3.2 CPAS Project GFE Safety and Reliability (WBS 1.5.7.2.x)
Perform flight (including developmental flight test) safety, reliability, and mission assurance for GFE. Provide Mission Assurance support for CPAS in accordance with the requirements established in Paragraph 2.2.1 above.

2.3.1. CPAS Project GFE Quality Assurance (WBS 1.5.7.2.x)
Provide Quality Assurance support for GFE in accordance with the requirements established in Paragraph 2.2.2 above.

2.3.2 CPAS Project GFE Quality Engineering (WBS 1.5.7.2.x)
Provide Quality Engineering support for GFE in accordance with the requirements established in Paragraph 2.2.3 above.

2.4 CEV Aeroscience Project (CAP) (WBS 1.5.7.3)
Perform Process Assurance activities in support for GFE in accordance with the Constellation Program S&MA requirements.

2.5 Constellation Low Impact Docking System (Cx LIDS) (WBS 1.5.7.4)

2.5.1. Cx LIDS Project GFE Safety and Reliability (WBS 1.5.7.4.x)
Perform flight safety, reliability, and mission assurance for GFE. Provide Mission Assurance support for Cx LIDS in accordance with the requirements established in Paragraph 2.2.1 above.

2.5.2. Cx LIDS Project GFE Quality Assurance (WBS 1.5.7.4.x)
Provide Quality Assurance support for GFE in accordance with the requirements established in Paragraph 2.2.2 above.

2.5.3. Cx LIDS Project GFE Quality Engineering (WBS 1.5.7.4.x)
Provide Quality Engineering support for GFE in accordance with the requirements established in Paragraph 2.2.3 above.

2.5.4. Cx LIDS Project GFE Software Assurance (WBS 1.5.7.4.x)
Provide Software Assurance in support of GFE in accordance with the requirements established in Paragraph 2.2.4 above.

2.6 APAS to LIDS Adapter Segment (ATLAS) (WBS 1.5.7.5)

2.6.1. ATLAS Project GFE Safety and Reliability (WBS 1.5.7.5.x)
Perform flight safety, reliability, and mission assurance for GFE. Provide Mission Assurance support for ATLAS in accordance with the requirements established in Paragraph 2.2. 1 above.

2.6.2. ATLAS Project GFE Quality Assurance (WBS 1.5.7.5.x)
Provide Quality Assurance support for GFE in accordance with the requirements established in Paragraph 2.2.2 above.

2.6.3. ATLAS Project GFE Quality Engineering (WBS 1.5.7.5.x)
Provide Quaiity Engineering support for GFE in accordance with the requirements established in Paragraph 2.2.3 above.

2.6.4. ATLAS Project GFE Software Assurance (WBS 1.5.7.5.x)
Provide Software Assurance in support of GFE in accordance with the requirements established in Paragraph 2.2.4 above.

2.7 ISS CEV Communication Adapter (ICCA) (WBS 1.5.7.6)

2.7.1 ICCA Project GFE Safety and Reliability (WBS 1.5.7.6.x)
Perform flight safety, reliability, and mission assurance for GFE. Provide Mission Assurance support for ICCA in accordance with the requirements established in Paragraph 2.2.1 above.

2.7.2 ICCA Project GFE Quality Assurance (WBS 1.5.7.6.x)
Provide Qualrty Assurance support for GFE in accordance with the requirements established in Paragraph 2.2.2 above.

2.7.3 ICCA Project GFE Quality Engineering (WBS 1.5.7.6.x)
Provide Quality Engineering support for GFE in accordance with the requirements established in Paragraph 2.2.3 above.

2.7.4 ICCA Project GFE Software Assurance (WBS 1.5.7.6.x)
Provide Software Assurance in support of **GFE** in accordance with the requirements established in Paragraph 2.2.4 above.

2.3 DELIVERABLES
Requirements Verifications 1 Certification Status
SDF Assessments
S&MA Assessments and Presentations
Code assessments
RIDS
List of Auditors
Audit Reports

Master Audit Schedule
Technical and metric analysis
Subcontractor performance reports
Draft letter of delegations
Recommendations for acceptance of ADPs and GCARs
QREX Reports

3.0 PERIOD OF PERFORMANCE: October 1 2009 - April 30, 2010

4.0 ESTIMATED COSTS:

Contractor may provide travel, training, materials, and other non-labor resources as necessary to support task order requirements. Training may include selected professional discipline-based or spaceflight-based conferences with approval of the TMR.